



BELLE W. BARUCH
INSTITUTE FOR MARINE
& COASTAL SCIENCES

Coastal Training Program North Inlet-Winyah Bay National Estuarine Research Reserve

P.O. Box 1630 • Georgetown, SC 29442 • 843-546-6219 Ph. • www.cas.sc.edu/baruch/net

Innovative Development Approaches for Wetland Protection

Working Within The Regulatory Framework

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Introduction

- Wetlands – What/Where/Why
- Development Strategies & Asset Management
- Due Diligence (Site Assessment)
- Project Planning Approach
- Creative Development Concepts
- Wetland Mitigation – Congaree Carton Mitigation Bank
- Conclusions



Image courtesy of EARTHWORKS



Image courtesy of EARTHWORKS

What are Wetlands?

Why are they so important to Storm Water Management



- Definition: “Those areas that are **inundated or saturated by surface or ground water** at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of **vegetation** typically adapted for life in **saturated soil conditions**. Wetlands generally include swamps, marshes, bogs, and similar areas.”
- “**Hydrology**” They act like sponges by retaining rainfall and then slowly releasing excess water during more arid seasons. Their temporary storage capacity helps reduce erosion and limit flooding.
- “**Habitat**” They provide temporary and permanent habitat for fish, plants, and other wildlife. Many endangered species and (according to some estimates) over 100 bird species, and 200 fish species depend on wetlands for survival. 50% of the waterfowl come from prairie pothole marshes, which represent 10% of the wetlands of the US.
- “**Water Quality**” They improve water quality by filtering inflow to lakes, rivers, and streams. The vegetation found in wetlands trap sediments and remove nutrients from runoff and surrounding soil. This reduces the growth of invasive species, which deteriorates waterway health by stealing the oxygen that plants and animals need for survival.

Water Quality & Wetlands

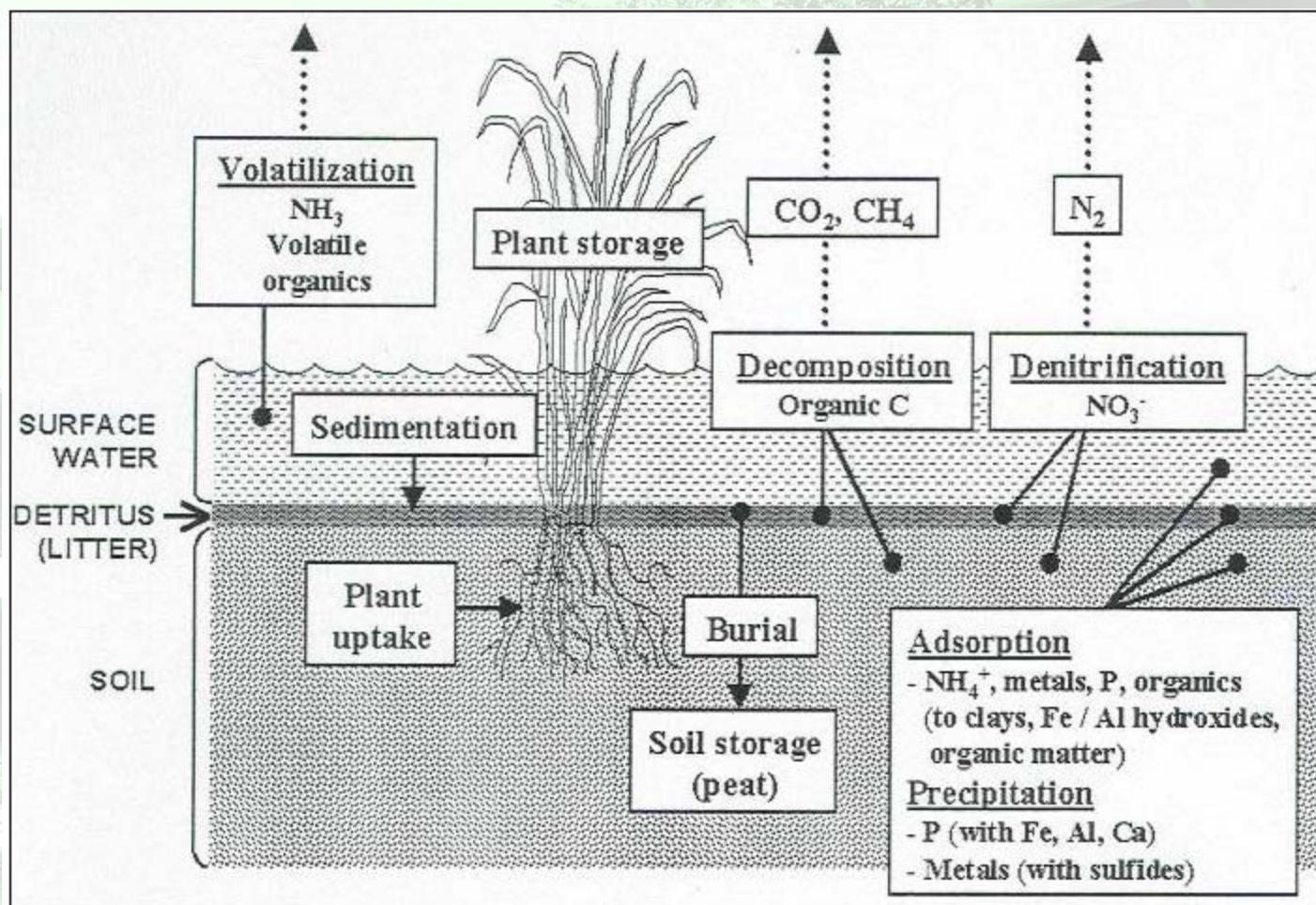
Pollutant Removal Mechanisms



- **Non-point source pollutants & their typical sources**
 - Sediments (agriculture, erosion, construction, utility installation)
 - Nutrients (fertilizers, manure, organic waste)
 - Oils and Greases (Cars, trucks, equipment)
 - PAH's (Vehicle emissions)
 - Metals (vehicle emissions, manufacturing, fuel burning activities)
 - Pathogens (bacteria/viruses – pets, septic systems, wildlife)
 - Pesticides/Toxic Chemicals (specific applications or spills)
- **Physical Capture/Filtering** – trapping particles in vegetation/detritus, settling out in standing water bodies, adsorption to surfaces
- **Biological Degradation** – breakdown of pollutants through physical or chemical processes
- **Uptake of Nutrients** – plant materials utilize nutrients for growth, some plants can absorb metals and toxics

Water Quality & Wetlands

Physical, Chemical & Biological Mechanisms



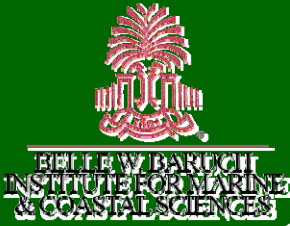
Courtesy of the Soil and Water Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Published: May 1999



Development Strategies & Asset Management

- Developers often view wetlands as an obstacle to the development process
- The overall asset value is the sum of the location, soils, drainage, view corridors, vegetation and trees, zoning, and other natural resources
- The overall project goal should consider the best and highest use of the land to provide functional project with high quality features and aesthetics
- A snapshot of the property's physical characteristics (Site Assessment) should be taken at the Due Diligence Phase to understand the potential future value of the site
- Wetland areas typically have poor soil conditions which can increase the cost of road or building construction significantly
- Some sites may provide more value through atypical development scenarios (Conservation Development or Mitigation Banking), depending on market drivers and conditions
- A quality development plan maximizes the asset value by recognizing all characteristics and integrating them into the project





Due Diligence

- Due Diligence is the first step in any land acquisition – investigation of the potential investment
- Due Diligence is the standard of care a reasonable person should take before completing the transaction
- Due Diligence provides crucial information needed to make a “GO / NO GO” decision
- Typical information gathered during the Due Diligence timeframe includes:
 - Plats or other Survey Data
 - Phase 1 Environmental Site Assessments (ESA) that are required under CERCLA to provide “Innocent Landowner” defense
 - Wetland approximations & subsequent Jurisdictional Determinations
 - Threatened and Endangered Species (T&E) survey
 - Archeological survey



Project Planning Approach

Section 404(b)(1) provides a three-step sequence for mitigating potential adverse impacts to wetlands - first avoidance, then minimization, and lastly compensation for unavoidable impacts to aquatic resources.

Identify-Avoid-Minimize-Mitigate

- **Identify** aquatic resources on your project site to determine size, type, and location (what are your assets and where are they)
- Land Planning should **avoid** aquatic resources and utilize these areas for storm water management, green space, and natural areas
- Unavoidable Impacts must be **minimized** to the extent practicable to achieve the project goal (bridging, limiting access points, bulkheads, etc.)
- Compensatory **Mitigation** required to offset the adverse affects of wetland fill
 - On-site Mitigation (protective buffers, restoration, creation)
 - Off-site Mitigation (Project Specific locations)
 - Mitigation Credits



Land Planning

A quality land plan balances the needs of the Developer with the utilization of the resources contained on the site to provide a functional product that works with the environment.

Developer Needs: project density, cost-effective construction, aesthetics

Site Resources: Drainage areas, wetlands, soils, vegetation, slopes, view corridors, access to roadways, utilities, etc.

Conservation Development consists of utilizing land in a manner that maximizes the amount of open space while maintaining density.

Residential density is clustered to reduce infrastructure cost and conserve open space.

Conservation Development has 4 basic steps

- (i) identifying primary and secondary conservation areas,
- (ii) designing open space to protect them,
- (iii) arranging houses outside of those protected areas, and
- (iv) finally laying out streets, lots, and infrastructure



Moss Park

Constructed Stormwater Wetlands



- **Constructed stormwater wetlands are manmade depressions that create growing conditions suitable for wetland vegetation and functions.**
- **Constructed wetlands are intentionally installed on non-wetland sites to enhance the quality of stormwater runoff.**
- **Constructed wetlands are typically cheaper due to reduced excavation costs**
- **Regulatory Approvals - County & OCRM were very supportive**

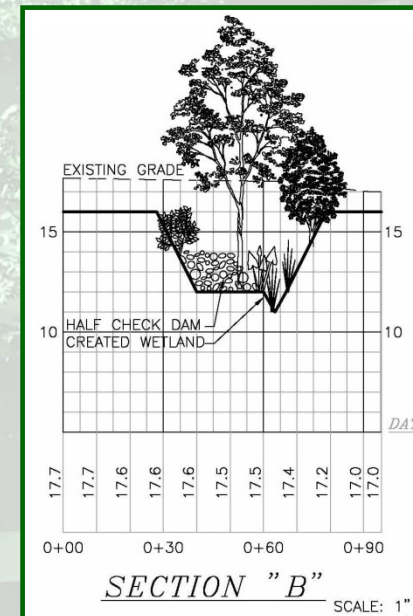
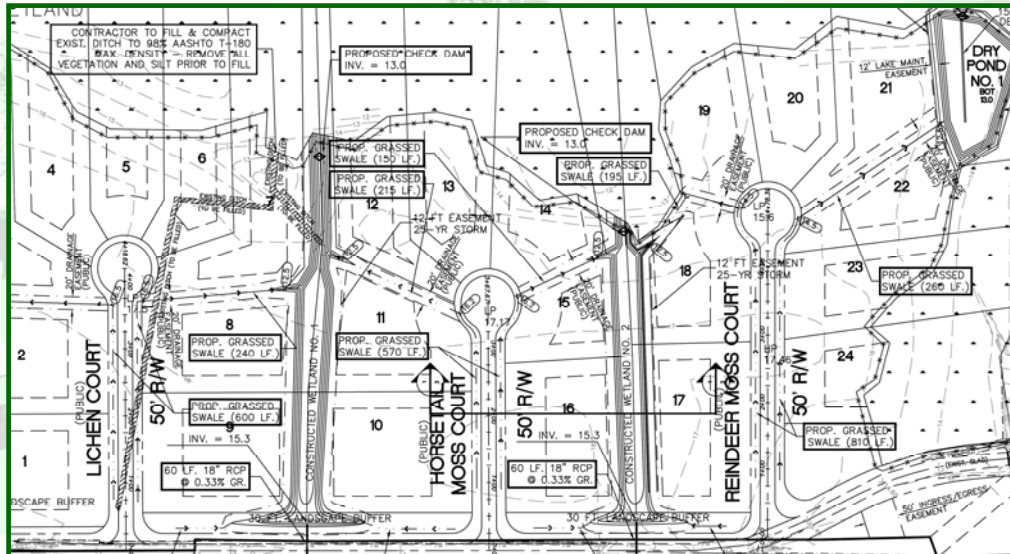


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Moss Park

Constructed Stormwater Wetlands

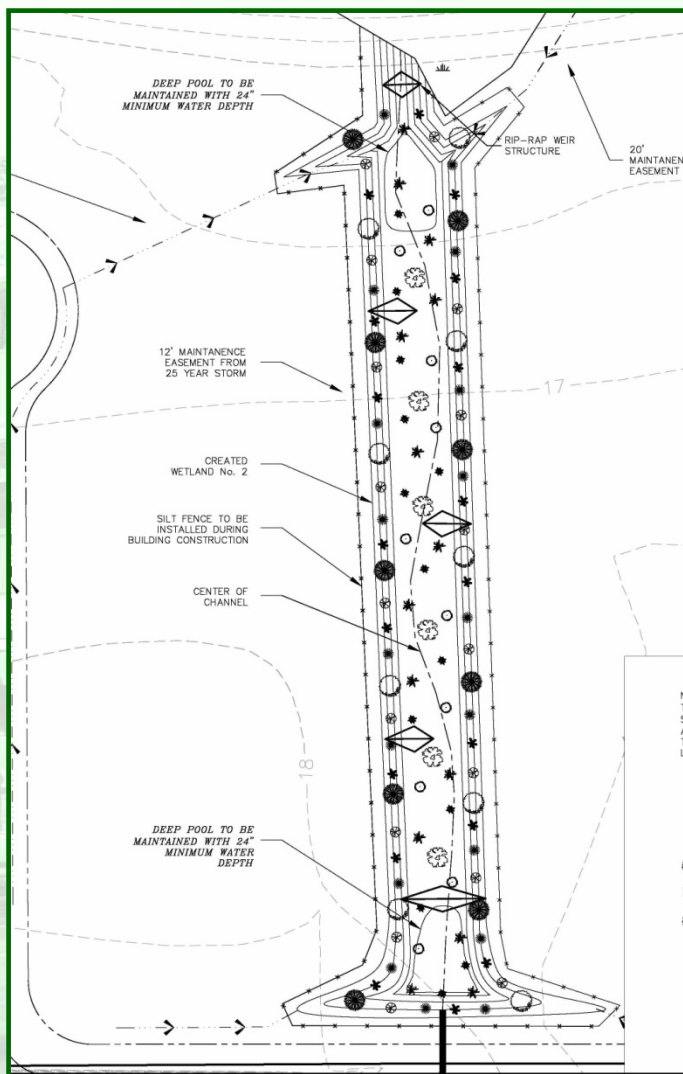


- Constructed wetlands connect into the existing drainage run at similar elevation to reduce runoff velocity
- A constructed stormwater wetland can achieve high removal rates of particulate and soluble pollutants (nutrients) through gravitational settling, wetland plant uptake, absorption, physical filtration, and biological degradation










Moss Park

Constructed Stormwater Wetlands

- Native species are selected to ensure success
- Imported hydric soils add seedstock and rootstock to the plantings to improve success
- Planting helps to reduce invasive species



PLANT LEGEND:

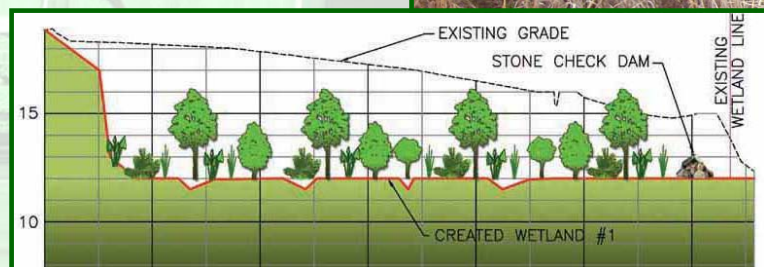
<u>SCIENTIFIC NAME</u>	<u>COMMON NAME: AMOUNT, SIZE</u>
 <i>Persea palustris</i>	Swampbay: 20 @ 3 Gallons
 <i>Taxodium distichum</i>	Bald Cypress: 18 @ 3 Gallons
 <i>Nyssa biflora</i>	Swamp Tupelo: 20 @ 3 Gallons
 <i>Itea virginica</i>	Henry's Garnet: 45 @ 1 Gallon
 <i>Myrica cerifera</i>	Wax Myrtle: 46 @ 1 Gallon
 <i>Viburnum obovatum</i>	Walter Viburnum: 32 @ 1 Gallon
 <i>Juncus effusus</i>	Softrush: 27 @ 1 Gallon
 <i>Saururus cernuus</i>	Lizard's Tail: 24 @ 1 Gallon
 <i>Pontederia cordata</i>	Pickerselweed: 29 @ 1 Gallon



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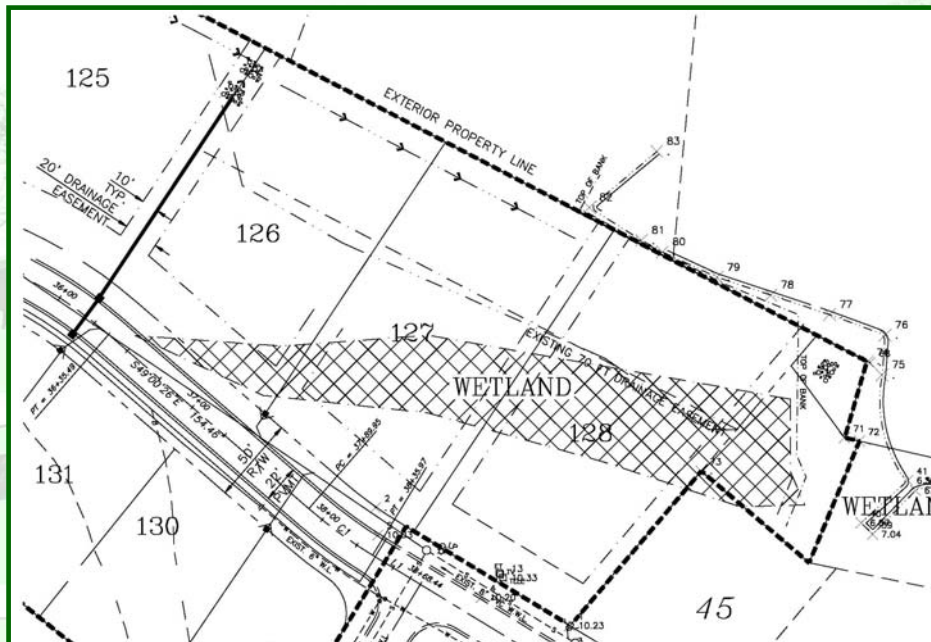
Constructed Stormwater Wetlands



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Ricefields Created Wetlands



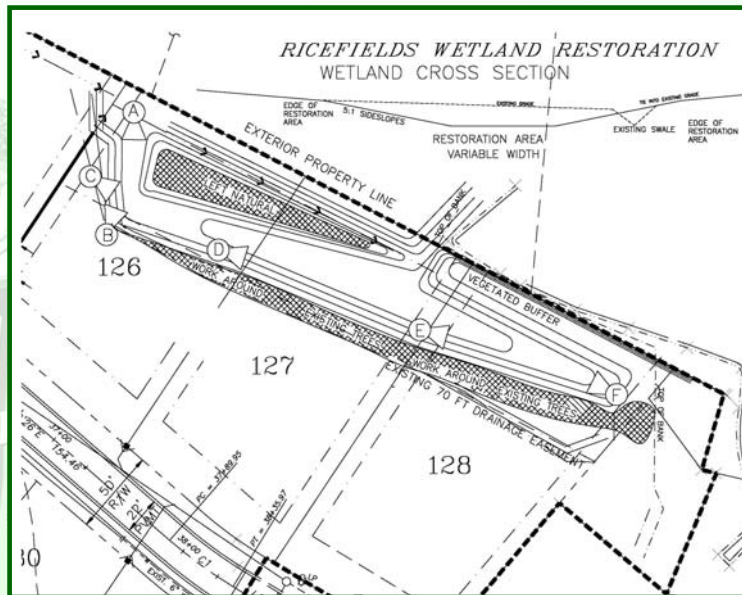
- Ricefields Subdivision filled in a small drainage finger off of an existing lake to construct houses
- Wetland fill permit was overturned by Court and the Developer was required to





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Ricefields Created Wetlands



- **EARTHWORKS designed a created wetland to replace the form and function of the previous finger in a location near the original site to maintain lots**

- **Proper design and construction provided project success in 2 years and additional monitoring was not required**

- **Success was achieved by providing proper soils and hydrology to allow vegetation to thrive.**

- **Import of hydric soil provided seedstock and rootstock that eventually outgrew the planted materials**

- **Predation by mammals reduced survival of planted trees**

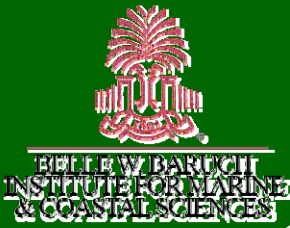


Silver Fox Landing Wetland Integration



- Developer constructed the subdivision adjacent to Mill Creek Swamp without impacting the hardwood swamp surrounding two sides of the project.
- Lots facing wetlands situated on a bluff with decks overlooking bottomland
- Bluff lots allowed for creation of “basements” on the rear portions of the houses, adding 2 or more bedrooms
- No wetland fill permits were required because the site was designed to fit in the landscape.





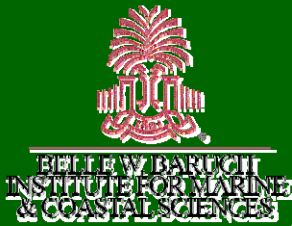
Silver Fox Landing Wetland Integration



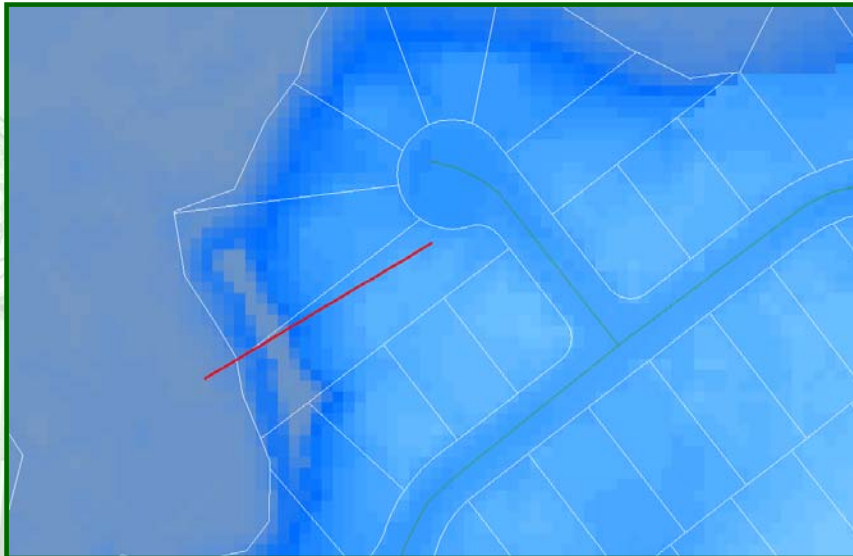
1999 Color Infrared Aerial



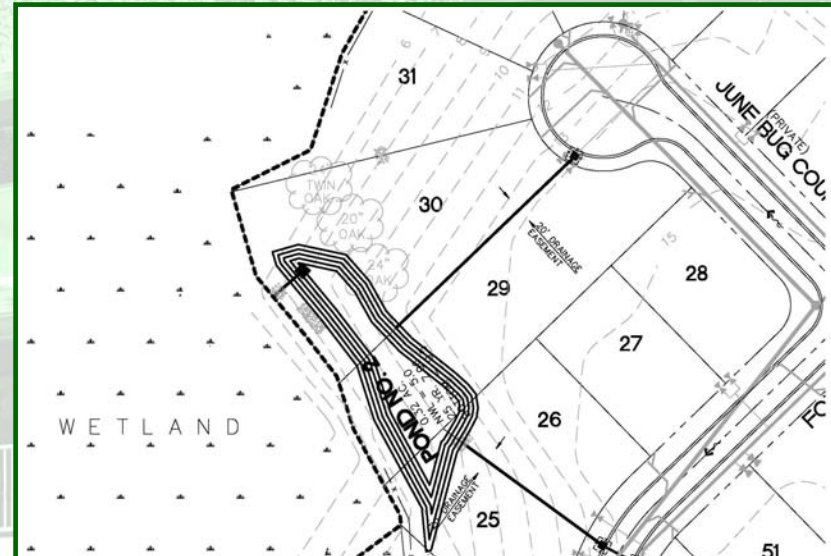
2006 Natural Color Aerial



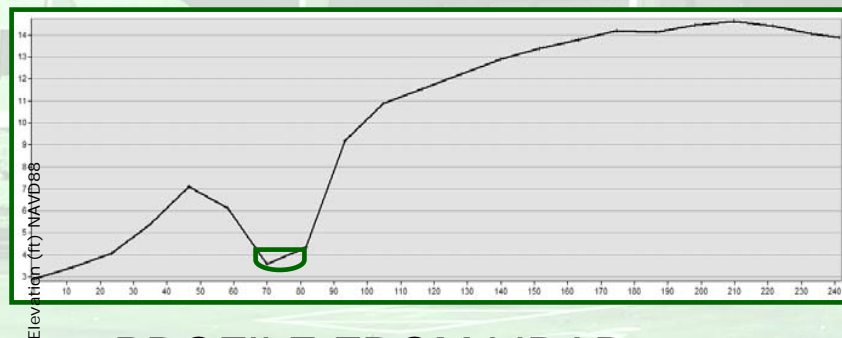
Silver Fox Landing Wetland Integration



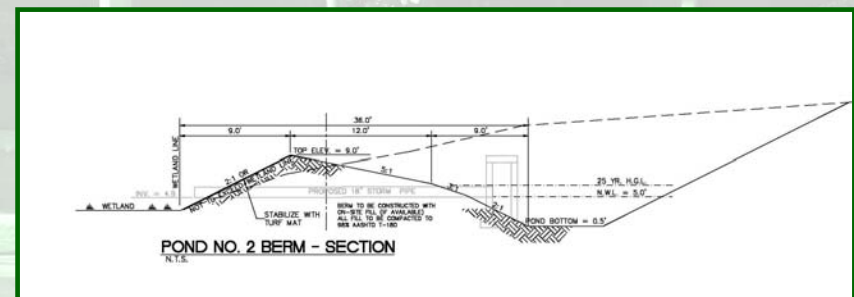
SITE PLAN FROM LIDAR DATA



SITE PLAN FROM CAD DWG

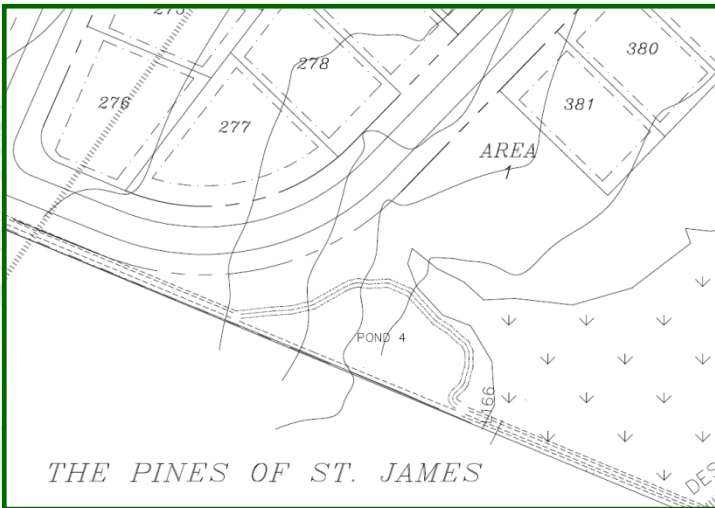


PROFILE FROM LIDAR



Pines of Saint James Wetland Integration

- Developer constructed this subdivision adjacent to Collins Creek Swamp without impacting hardwood swamp surrounding two sides of the project
- Lots backing up to wetlands provide wooded views
- Storm water system ended at a pond with an overflow weir into the swamp for gradual discharge without impacting groundwater elevation
- No wetland fill permits were required because the site was designed to fit in the landscape

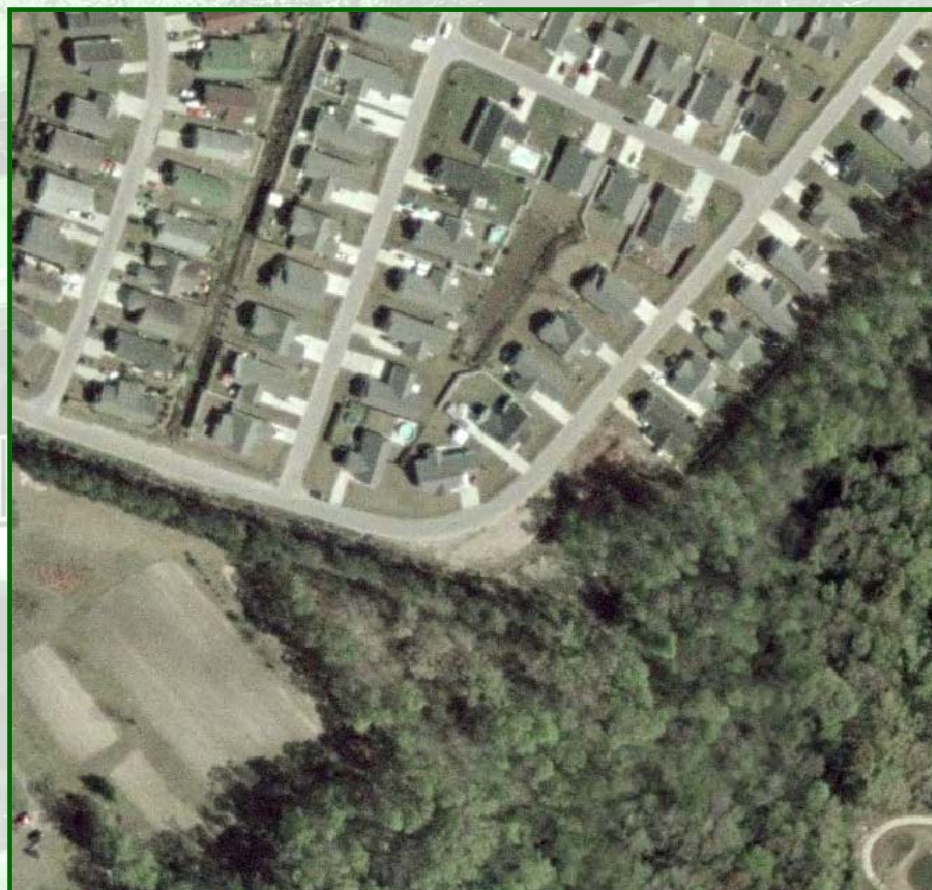




Pines of Saint James Wetland Integration



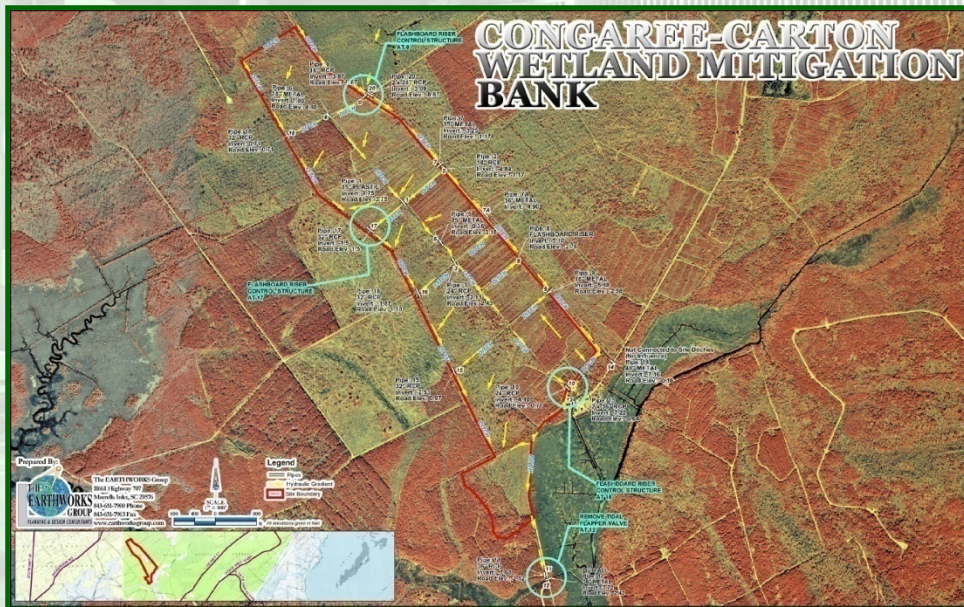
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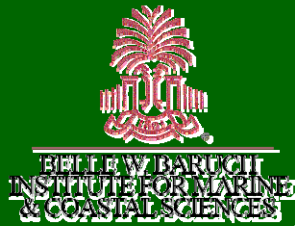


2006 Natural Color Aerial

Congaree Carton Wetland Mitigation Bank

- Our client owned a large forested tract that was previously used for timber production
- Portions of the tract had poor timber yield due to inadequate soils types and hydrology
- EARTHWORKS established a commercial mitigation bank to provide maximum asset value
- Our client retains ownership and recreational use of the property in perpetuity
- Wetland Mitigation Credits are currently \$2700 and are expected to continue to increase in value





Conclusion

- Perform Due Diligence at initial planning phase to understand what the property assets are
- Spend time looking at options to create a Land Plan that works with the property and maximizes assets
- Utilize wetland resources for their aesthetic and natural values
- Minimize wetland impacts through alternatives analysis and proper land planning
- Keep up with latest trends in sustainable design so that you can compete in today's market